SELF-DIRECTION AND PROGRAMED INSTRUCTION FOR FIVE DIFFERENT TYPES OF LEARNING OBJECTIVES[1]

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In any given class of students at any given moment, differences among students in what is known and what is easily learned are great. Homogeneous grouping on the basis of ability tests doesn't help much (Borg, 1963), probably because the effect of any example or explanation depends on the particular past experience of the student, on his interests, and on the extent to which at that moment he is distracted by some other thought or feeling.

More individualized instruction seems called for, and indeed most recent developments in education—the emphasis on better text books, teaching machines and programed instruction, computer-based systems—indicate a general movement toward more individualized instruction. This opens up a new dimension of choice to educational planners. That new dimension is the degree to which the learner controls the learning process himself as opposed to our controlling it for him, and this has been the central issue of our research. We have sought to tentatively identify instructional techniques and subject matters which most effectively utilize students' capacities for self-directed learning.

Control of the learning process by the learner is not feasible with group methods of instruction, such as lecture and discussion. Individualized instruction permits learner control, yet new developments in education, especially programed instruction, are predominantly headed toward giving the student even less control than he has with an ordinary textbook, for example. This may be a good thing in some cases, but for many learning objectives, perhaps most, there is reason to believe that we should be moving in the opposite direction, toward more freedom and control for the student, not less.

A number of field studies have compared various self-directing or learner-centered methods with teacher-centered methods, and have yielded conflicting results (Briggs, 1947, 1949; Pressey, 1949; Russell, 1953; McKeachie, 1954; Thompson & Tom, 1957; Hunnicutt & Iverson, 1958; Olson, 1959; Anderson, 1963). A study by Gruber and Weitman (1962) was probably the most comprehensive in that self-direction (by college students) was examined across many different subject matters and for many criteria, including long-term attitude changes.

In most of the above studies the implicit or explicit comparison condition was a group method of instruction, such as lecture-discussion, so that degree of student control was often confounded with differences between individualized and group methods of instruction. The present research took individualized programed instruction as its primary vehicle for studying variations in degree of learner control for several reasons:

1. To control for differences between group and individual methods.

[1]The research reported herein was conducted under a grant from the Office of Education, U. S. Department of Health, Education, and Welfare. The author gratefully acknowledges substantial assistance in all phases of research from L. W. Bivens, D. F. Terry, Jeannette Stephens, Madalynne Chapman, and D. C. Berliner. We are indebted to the following California school districts for providing *Ss*: San Mateo Union High School District, San Mateo City Elementary School District, Sequoia Union High School District, Menlo Park City School District, and Cupertino School District.

2. Printed instruction facilitates equating the *content* of instruction presented under different conditions.

3. Careful presentation of content and step-by-step evaluation of progress through active participation by the learner enable both the reasearcher and the learner to examine and control the learning process in greater detail than could be expected with most other general types of instruction. Mager and Clark (1963) report such a series of intensive studies of how individuals direct their own study. Their results and those of Allen and McDonald (1963) suggest that a high degree of freedom and control by the learner may save substantial time in reaching given learning objectives.

The rationale for the present research was developed largely from a cognitive theory which is presented and discussed in detail in relation to learning in a separate report (Campbell, 1963b). From both theory and past research evidence on learning came the conviction that two things most generally important to rate of learning are:

1. Meaningfulness to the student of the learning task at any moment.
2. Motivation: Is the learner trying?

Here are the ways in which meaningfulness and motivation would seem to foretell success or failure of self-direction by the student.

Meaningfulness. The main reason for individualizing instruction is so that it can be adapted continually to each student's progress. This means accurately *evaluating* the student's progress fairly often. And who can best evaluate meaningfulness at any moment? The student, I believe. Meaningfulness is not solely a property of the learning task, as often implied. Rather it is a joint property of the task and the student. One man's meaning is another man's nonsense. When meaningfulness is to be evaluated every few minutes or even oftener, I seriously doubt that a teacher or program can do it as well as the student himself can. If the instructional situation were designed to quickly offer the student alternative examples and ways of learning, the student might be better able to direct himself to more meaningful study than could a program or teacher.

Let me suggest three situations in which the student may best evaluate and direct his own learning so as to maximize relevant meaning:

1. When problem-solving or reasoning is the main learning objective, especially common in mathematics and science. When the learner is expected to develop and pursue a line of thought, attempts by an outsider to evaluate the process may constitute an intrusion, a disruption of the line of thought, as may be the case with very small-step programs requiring student response at every step. Even when direct guidance is not disrupting, the student may sometimes benefit more by discovering solutions without any outside help (e.g., Kersh, 1958).
2. A second important kind of situation in which the learner may be the best evaluator of meaningfulness is when he is trying to learn new ideas, perhaps the most difficult of all teaching tasks. The reason it is so difficult, if the idea is really new and not some simple combination of already familiar ideas, is that input (verbal or other) to the student is of such uncertain effectiveness. Since the idea is new, a good deal of indirect information con-

taining much that is irrelevant must be presented, and to what extent the student is abstracting the important properties from these events is pretty unpredictable. Therefore, the student's own sense of having grasped the new idea should be helpful in adapting subsequent instruction.

3. The third situation favoring self-direction arises whenever instruction involves nearly continual communication to the student. The student's memory span may be surpassed at any moment by the rate of input to the effect that unless the student can stop and catch up, rehearse, rethink, further information may be of no benefit and may even confuse and distract the learner. Since memory span is not a constant for the student but fluctuates rapidly according to familiarity, concentration, etc., only the student himself can monitor comprehension or meaningfulness of input closely and continuously enough to effectively adjust rate of input and size of step. It seems likely that this is the main reason why reading matter is nearly always found to teach more efficiently than even a carefully prepared lecture—in a word: self-pacing.

Motivation. The other major factor critical to self-direction needs little elaboration. If the student will not try to learn, more freedom probably not only will not help, it may even detract. In one 9th grade general math class, when students in the self-directing group were told the setup on the first day of the experiment, one boy asked, "You mean its entirely up to us how we do it?" When told, yes, that was so, he stacked his learning materials in a neat pile and never looked at them again during the two weeks of the experiment. But if a student wants to learn he would surely want also to direct his own study effectively, given the chance. For many students, greater freedom and responsibility in itself may increase motivation to learn.

Turning now to our research we investigated self-direction with five different kinds of learning tasks meant to represent typical kinds of learning encountered in formal education. The basis used to classify and differentiate among learning tasks is discussed in detail in the previously cited theoretical report (Campbell, 1963b).

Our general approach with all kinds of learning tasks was to compare what seemed to be the most promising conditions of self-direction with what seemed to be the most effective way of teaching the same thing with minimum student control. Intermediate or variable degrees of student freedom may ultimately be most effective, but we felt that maximizing the contrast in these preliminary exploratory studies would be the most economical plan for identifying the main strengths and weaknesses of self-direction.

Since there are an unlimited number of alternative sets of learning activities that could be offered to self-directing students, the results of the present experiments are of course not definitive tests of "self-direction" as a generalized approach. We tried to select the most promising alternatives for experimentation. Initial selection was based on specific characteristics of each learning task, on theory and on interpretation of previous studies. For all types of learning objectives except the last studied (history), formal experimentation was preceded by tryouts of various study tactics with a few individual students. A number of study activities were judged to be impractical or ineffective on the basis of these tryouts and excluded from further study.

Mathematics

The first kind of learning task investigated was represented by two units from mathematics: set theory, and permutations and combinations. The important features of these learning tasks are that problem-solving, reasoning, and forming new ideas are main objectives. As hypothesized earlier, these are learning requirements which the student himself would seem best equipped to evaluate and direct, because the meaningfulness and relevance of input depends so greatly on each student's particular thought processes.

Another characteristic of these tasks is their hierarchical structure (Gagne, 1962), in which initial ideas must be mastered before the student can progress because subsequent ideas build on these and depend closely on them. (It helps a great deal if the student understands what elements and sets are before he tries to learn about intersections or unions of sets.) A hierarchical task highlights the importance of frequent individual evaluation, and hence provides a more critical test of whether the student can evaluate and guide himself effectively. For these reasons we spent as much time investigating this type of learning as we did the other four types combined.

For the mathematics units the minimum-student-control format was a linear self-instruction program. We did not incorporate automatic branching in the programs because a large-scale study with the sets program had shown no benefit from the branching procedure (Campbell, 1963a). The linear program contained questions varying in difficulty and intended more to stimulate thought than to shape behavior. In these minimum-student-control programs the student did retain control in two important ways: The program was self-paced and the student could consult the teacher at any time. Without this degree of self-direction the programs would have seemed rather unrealistic and arbitrarily restrictive. Students were required to proceed through the program pages in fixed order, however, answering all questions and reading all the material.

The self-directing format used the exact same printed pages of instruction, but arranged them differently. The program was divided into four separate components:

1. A short basic text (actually a short linear program with only occasional questions)
2. Supplementary examples and explanations
3. Self-testing questions
4. A two-page outline of the entire lesson

These four physically separated components were cross-indexed to each other by a simple numbering or lettering of pages. The student had the four components before him at all times and could use them in any manner or sequence he pleased. He was not required to respond to test questions nor to read all the material. As with the linear programs, students could consult the teacher at any time.

Form of Feedback

In both the self-directed and linear forms, the correct answer to a question always appeared on the following page. This issue of whether and how to provide answers to questions was quite central to self-direction since valid self-evaluation of learning progress is the only logical basis for self-direction, and while the student

is checking answers to questions seems to be an especially suitable time for self-evaluation. We conducted a separate preliminary experiment (Bivens, 1964) with the sets program in which form of feedback given the student was the only independent variable in an otherwise linear program.

The hypothesis was that simply giving direct answers to questions may cut short reasoning by the student and shunt him on to the next point before he has thought it through. So, instead of a direct answer, we gave him a similar problem worked out, answer included, from which he was to generalize and infer whether his answer to the first problem had been correct. The experiment compared this "complex" answer form to simple answers and to various ways of combining complex and simple answers, including a self-directed form in which the student could choose between the simple and complex answer at any time. Each of these methods was tried with a group of over twenty students randomly drawn from the same classes and of about the same mathematical ability. Differences between groups in amount learned after equivalent time spent studying were negligible.

Since form of answer did not seem to be of great importance, we gave simple answers to all questions in our two main experiments comparing self-direction with linear programed instruction.

Experiment I

The first of these experiments (Bivens, Campbell, & Terry, 1963) was conducted with students in two 9th grade general math classes, representing approximately the lower two-thirds of the mathematical ability range. The permutations-combinations unit was given first, in self-directed form to one class and as a linear program to the other class. After eight fifty-minute periods of study, all students took a criterion test (all test items were different from questions in the program), which emphasized generalization and application of concepts to new problems as opposed to rote memory.

Two weeks later the unit on set theory was given using the same experimental prodecures, except that the learning methods were reversed for the two classes. That is, the class that had studied permutations with self-direction studied sets with a linear program, and vice versa for the other class. About one month after completion of each unit all students were given the same final test again as a measure of retention.

Results. The self-directed and linear methods were equivalent in effectiveness in that the two methods did not differ significantly (statistically or educationally) on the final test, on the retention test, or on time spent studying. So with these low-ability students self-direction did not adversely affect learning, but neither did it improve it. We next sought ways to make self-direction more effective, and recalled again the two major theoretical prerequisites for effective self-direction: motivation, and ability to evaluate one's own learning needs. Both of these fundamentals were treated more explicitly in the second experiment with the mathematics units.

Experiment II

The second experiment (Campbell, Bivens, & Terry, 1963) utilized the 34 students in a summer school 9th grade algebra class representing approximately the *upper* half of the mathematical ability range. In order to assess motivation for the

learning task and its relation to learning method, before the experiment started students were mailed brief ten-page programs on each of three topics, one of which was set theory. They read these and rated each topic as to how much they would like to study more about that topic. At the time they did not know of the forthcoming experiment with the set theory unit.

The experiment itself employed the same two mathematics units as before, arranged in the same two formats: a linear program as opposed to a set of four components arranged for self-direction. The overall design, however, was different from that of the previous experiment, as shown in Table 1.

TABLE 1. SECOND EXPERIMENT ON SELF-DIRECTION WITH PROGRAMED MATHEMATICS UNITS: DESIGN AND MAJOR RESULTS

		Week of Coached Practice (Permutations-Combinations Unit)		Week of Uncoached Study (Set Theory Unit)			
					First posttest		Final test
Group	N		Mean final test score*		Study time (Min.)	Gain* Score 1	Gain* Score 2
1.	10	Coached practice in self-direction	42.0	Self-direction	138	19.9	19.5
2.	7			Self-direction	157	16.1	14.5
3.	9	Coached practice in study of linear program	33.2	Linear program	135	10.4	17.0
4.	6			Linear program	138	16.4	18.9

*Corrected to control for differences between groups in average ability.

Coached Practice. Nineteen paid volunteers from the class were given approximately four hours of coached practice (1 hour per day immediately following their algebra class) in either self-directed or linear study, using the permutations-combinations unit. For self-directing students (randomly chosen) the major portion of the first coaching session was devoted to a group discussion intended to cause each student to think about self-direction in his own schoolwork and to relate this to the material at hand. During the remainder of the coached practice sessions, each self-directing student studied the program materials in whatever manner he chose. Our coaching consisted of nothing more than interrupting each session once or twice in order to elicit discussion of study tactics, and to get the students to critically evaluate their own procedures. What manner of self-direction they practiced was entirely up to them.

In the linear practice sessions, we emphasized the step-by-step study procedure, reminding the group to read all the material carefully and exactly in the manner prescribed since they were not permitted to retrace. Study sessions were occasionally interrupted and student opinion of the form and content of the lesson was solicited.

The last day of practice was concluded by giving all students in both groups a criterion test over permutations and combinations. Self-directing students were urged to apply any new study skills or perspectives to the study of sets during the week to come.

The whole class studied the sets unit the following week during regular class periods. As shown in Table 1 the previously coached self-directing group again got self-direction and the previously coached linear group again took a linear program. The remainder of the class which had had no practice or coaching was divided randomly between the self-directing and linear treatments. No coaching was given to any group during the sets unit, only initial instructions as to procedure. All students took a pretest on sets before they began studying. After five days of study (forty minutes per day) all students took a final test on sets, the same one given as a pretest. During the week of studying sets all students took a parallel form of the criterion test. Self-directing students took it whenever they felt ready. Linear-program students took it just before the final review portion of the program.

Results. As shown in Table 1, self-direction was superior after, and only after, coached practice in self-direction. Without coached practice the results were comparable to the first experiment: no appreciable difference between self-direction and a linear program. Analyses of covariance on all criterion posttests (gains from pretest to protest for the sets unit) were performed with either mathematical ability or previous class grade as the control variable. The coached self-directed group were higher achievers ordinarily than the other groups, but after adjusting the group means to correct for such differences (means in Table 1 are corrected), the coached self-directed group was still significantly superior to the others on the permutations test and on Sets Gain Score 1, though not on Sets Gain Score 2.

Nearly half of the students in the combined self-directing groups reported reading their sets materials straight through, one whole component at a time, rather than adapting their study to step-by-step progress. In essence they were taking a linear program and a poor one at that. Only two of these eight "nonadapters" were from the "coached" self-directing group. When the eight nonadapters are omitted from the self-directing groups the superiority of self-direction is even more striking and significant ($p < .01$), the adjusted mean on Gain Score 1 being 21.5 for the coached self-directors and 20.3 for coached and uncoached self-directors combined. Support for our hypothesis that motivation is essential to self-direction was found in a closer look at the nonadaptive self-directors. Their class grades were significantly lower ($p < .05$) than the adaptive self-directors despite the fact that their ability scores were slightly higher. That is, nonadaptive self-directors were "underachievers" compared to adaptive self-directors.

Further support for the motivation hypothesis was obtained from our mailed questionnaire. Interest in studying set theory correlated positively with Sets gain scores (.31 and .47 for Gain Scores 1 and 2 respectively) in the self-directed groups, but not in the linear groups ($-.04$, $-.17$).

When the results from this experiment with high-ability students are combined with those of the first experiment with low-ability students, new findings emerge. Across the full-spectrum of mathematical ability there is a moderately high correlation between ability and criterion test scores for the self-directed groups (.75

for sets, .49 for permutations), but the correlations are somewhat lower for the linear groups (.41 for sets, .26 for permutations). The ability tests apparently tapped some skill relevant to self-direction, and perhaps motivation to a degree also. The comparison between adaptive and nonadaptive self-directors suggests, however, that if all students were given sufficient coaching and practice in self-direction, the correlation between standard ability test scores and amount learned under self-direction might be much lower.

Although learning efficiency criteria are our primary interest, we obtained interesting questionnaire data as to students' liking for self-direction as opposed to linear programs. The low ability classes preferred the linear programs, while in the high ability class students liked self-direction better.

Survey of the Far East

The second kind of task studied was a more loosely structured topic, a survey of Far Eastern geography. The main objective was acquisition of knowledge consisting mainly of facts and familiar ideas. In contrast with the mathematics tasks there was little emphasis on new ideas and none at all on problem-solving, nor did the main ideas appear to be hierarchically related. The scope and complexity of the underlying issues was perhaps greater, but such subtleties were barely touched upon, as must often be the case in a brief survey course.

We prepared self-directed and linear programed versions of three Far East units similar to the self-directed and linear versions of the mathematics tasks. The components for self-direction were a complete outline of all essential information, self-testing questions, supplementary text, maps, and photographs. Each of 12 junior high school volunteers studied one unit self-directed and one unit with a linear program. Our criterion of learning efficiency was study time required to score 90% on a test. All students were given practice in using the self-directing materials. However, it differed from the practice in self-direction of the mathematics experiment in two important ways: (1) The practice for the Far East unit was more structured (*S*s were given several alternative study tactics, and told to try each on a certain part of the practice unit), (2) The practice lasted on the average only 1 1/2 hours, compared to 4 hours in mathematics.

Results. Mean times to criterion were nearly identical for the two methods, even though students appeared to use the self-directing materials adaptively.

Self-direction with the Far East survey did *not* excel over a linear program. Was it because the practice in self-direction was shorter and different from that in mathematics? Or because of the hypothesized differences between the two tasks in kind of learning processes required? Both explanations are tenable.

Principles of Global Geography

At about the same time we conducted a larger study with 178 students (Campbell & Bivens, 1963) using a learning task which represented a blend of the first two kinds. The task consisted of two units of an existing 6th grade course in principles of global geography. It required learning new ideas in a hierarchical structure and some problem-solving, though not as much as the mathematics tasks. However it also contained familiar ideas and specific facts to be remembered as in the Far East survey.

The self-direction and linear methods were quite similar to those in the mathematics and Far East studies except that the self-test questions were an integral part of the program for both *linear and self-directed* versions rather than being a separate component for self-directors. An outline of the unit *was* a separate component for the self-directors and they were free to skip around and to use the outline, the program, and an atlas as they pleased. The linear program, as usual, prescribed the exact manner and order in which these same materials were to be studied. No coached practice was given to any group.

Criterion tests were given during study, immediately afterward, one-to-two weeks afterward, and again five months after learning. Self-direction and the linear program were virtually equivalent in effectiveness on all tests after equivalent study time. The students *preferred* self-direction, however, by a ratio of over 2 to 1.

Perhaps the most notable result of this experiment was the performance of one self-directed class which was given a learning method quite different from that just described. This class was given no program at all, that is, neither programed text nor self-testing questions. As in all classes they were free to consult the teacher privately and to use general classroom references, but the only individual study materials they had were the outline and the atlas, and they could use these in any way they pleased. The outline presented the bare essentials of the entire two weeks of geography covered by the experiment on just four pages.

Although of the same average ability as the other classes, this "no-program" self-directing class learned the same amount in one-half as much time, and retained it as well five months later. There was one drawback to this method however: both the teacher and the students hated it with a passion by the end of two weeks. The teacher's explanation was that simply studying the outline day after day was too intensive and monotonous.

Even those teachers who had the complete programs reported that their students needed a greater variety of study activities. During part of the following fall semester 12 geography teachers were given a list of 8 or 10 explicit kinds of learning activities and the teachers completed a daily checklist indicating which were used. Although in no way pressured to do so, nearly all of the teachers voluntarily employed a wide variety of activities over a week's time.

Ordered Specifics: Presidents' Names

A necessary if unexciting kind of learning requirement that forms at least a small part of nearly every school course is the learning of very specific things such as names, places, or objects, and associating them in some order or pattern. It seemed that for such a task a student might benefit by being able to adjust part size of instruction to his memory span. In an experiment designed to test this hypothesis, (Berliner, Bivens, & Campbell, 1963) sixty 6th graders tried to learn the names of the first 30 U. S. presidents, by seeing them shown one at a time in chronological order. Part size here meant how many names were projected in succession on a screen before the student was allowed to try to write them down. After six complete presentations of the list of 30 names, those students given a fixed part size approximately *twice* as long as their memory span (as pretested with telephone book names) had learned more ($p < .05$) than those given a fixed part size approximately equalling their memory span. Those allowed to adjust part size freely learned an intermediate

amount, even though the average part size voluntarily chosen was approximately equal to the smaller, *less* effective fixed part size.

History

The last kind of learning we have explored is typified by history and literature courses in which the student is expected to comprehend a great deal of content rapidly, but is not expected to recall many specifics. Aside from reading skill the critical problem for such a course, at least up through high school, seems to be motivation. Our approach to self-direction here was personalized. That is, for eight volunteers from an 11th grade history class we interviewed each student weekly. We tried to find out what *did* interest him in life (only one was initially interested in history) and to show him some relation between history and his own interests. We also diagnosed his current study methods and suggested more active, self-directive ways to organize his time, his notes, and his reading. The test grades of these students increased very gradually with respect to the rest of the class during the 6 weeks of our interviews, then dropped back to their original level, or below, when the individual interviews stopped. Changes in motivation and self-directed organization of study were apparently not well internalized. The most encouraging result was the superiority of this experimental group to the rest of the class ($p < .05$) on a transfer test given at the end of the experiment. This test required that they apply their knowledge of history imaginatively to hypothetical historical situations.

Conclusions

All of the studies conducted were preliminary explorations designed to reveal promising leads. It is not surprising that the best lead emerged from the mathematics studies. As noted before, this seems to be the type of learning objective for which appropriate instruction depends on the individual thought processes of each learner. The key to releasing students' capacities for effective self-direction in mathematics seemed to be coached practice. Why did practice in self-conscious appraisal by the student of his own learning activities help? Our classroom observations and early individual interviews strongly suggested the following as the primary reason: We broke their set for passive instruction, a set to do just as they are told, which is deeply ingrained after a few years of formal education. It seems to take a lot of jogging to get students out of this passive set. Verbal instructions alone seldom suffice.

Failure to break the passive set is probably why self-direction was not superior with the global geography task, which was somewhat similar to mathematics in its structure and the nature of the learning objectives. Three facts about the global geography experiment converge in support of this explanation:

1. No coached practice in self-direction was given.
2. Many students and most of the teachers voluntarily reported that the students followed almost exactly the same study procedure under self-direction as they did with the linear version. This was especially easy for them to do because the self-testing questions were left intact in the program, which was *not* true of the mathematics units.
3. The third supporting fact is that the self-directing class which had no pro-

grams, only the outline, learned as much in half the time. These students had no obvious habitual procedure to follow as did those with programs. They were forced to devise their own study plan.

The three tasks for which self-direction of some kind had a beneficial effect—mathematics, global geography, and the transfer test in history—all emphasized problem-solving and transfer to new situations. As discussed initially, these are learning objectives for which active self-direction was expected to be more effective than passive acquiescence. Since the expectation is corroborated by the present preliminary studies, longer-term studies of self-direction with this type of learning are needed in order (a) to estimate more stably the expected long-term educational gains, (b) to determine whether less coaching in self-direction, or coaching of a progressively changing quality, is needed after students have initially shaken their set for passive instruction, and (c) to test the hypothesis that as skill in self-direction is nurtured the correlation between learning gains and standard ability test scores decreases.

Finally, it is worth noting that in no experiment did self-direction have an adverse effect on learning. This is economically quite important, for if there is nothing to be lost in learning efficiency, self-direction could save a good deal of time and money that might otherwise be spent trying to ensure that each student follows a fixed sequence of steps.

Learning efficiency too might show greater gains over a period of years than we have demonstrated in our brief experiments, at least for students who are motivated to learn. If self-direction were to begin early in school and increase in scope as the student demonstrated his competence at it and saw that his reward was greater freedom and responsibility, by the time he was an adult the cumulative effect on his problem-solving, decision-making, and creativeness might be impressive.

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AUTO-ELUCIDATION WITHOUT PROGRAMING!

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Programing is now the magic word, in psychology and in education. However, there is much evidence bringing in question many features of orthodox programing, and indeed basic concepts thereof (Gagne, 1962; Pressey, 1963; Silberman, 1962). Nevertheless these concepts and methods continue to be used in the production of yet more such materials and with features increasingly in doubt. The three little experiments here reported not only press further certain criticisms of current programing now voiced by sundry skeptics, but offer an alternative application of feedback methods both far more practical and apparently more efficient then those now so strikingly in the ascendance. All three experiments were carried through as class undertakings in two or more of ten sections averaging some 35 students each, in the required course in human development and learning in the junior year in the College of Education, University of Arizona. These sections were, on the first day of the semester, all given a pre-test, and found essentially equal in preknowledge of the course—as might be expected since section assignments were at random.

[1]The paper summarizes portions of a research project having to do with adjunct auto-instruction under subvention of the Cooperative Research Branch, U. S. Office of Education, Project 2306